ſal of thoſe who may be inclin'd to inquire farther into this Part of Nature; and perhaps by the Continuance of this Method, in Proceſs of Time, a Diſcovery may be made of ſome regular Courſe in theſe Things, which may be of Uſe.

VII. *A* Collection *of the Obſervations of the* Solar Eclipſe, Feb. 18. 1736-7. *ſent to the* Royal Society.

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1. *The* Sun's Eclipſe *on* February 18. 1737. *obſerved in* Fleetſtreet, London, *by Mr.* Geo. Graham, *F. R. S.*

	Apparent Time. Ho.	Min.	Sec.	
At	2	25	9	P. M. a ſmall Impreſſion appear'd on the Sun's Limb; I judge the Beginning to have been about five or ſix Seconds ſooner.
	3	21	28	The Middle of the firſt and larger Spot was cover'd.
		29	30	The Middle of the ſmaller Spot.
		40	4	The Cuſps perpendicular.
	4	3	34	The Cuſps horizontal.
		35	32	The Middle of the larger Spot emerged.
		38	21	The ſmaller emerged, or a little before.

Ho.	Min.	Sec.		
4	52	57	The Chord between the Cuſps	1057
	55	00	The Chord	954
	56	32	The Chord	851
	59	34	The Chord	632

Then a Cloud cover'd the upper Limb, and prevented a Sight of the ending, which was ſoon after.

Between twelve and one o'Clock, I meaſur'd the Diameter of the Sun with a Micrometer. At the time of the greateſt Obſcuration, the lucid Part of the Sun's Diameter was equal to 392 ſuch Parts as his whole Diameter contain'd 2188.

I had a Tranſit of the Sun at Noon, and of *Sirius* at Night, which, compar'd with preceding ones, I found my Clock went too faſt for mean Solar Time, about one Second in a Day.

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2. *The ſame* Eclipſe *obſerved at the Royal Obſervatory at* Greenwich, *in Company with Dr.* Edm. Halley, *by Dr.* J. Bevis.

	Apparent Time. Ho.	Min.	Sec.	
At	2	25	39	P. M. The Beginning.
	5	03	29	The End.

At the End, the Sun's Limb appear'd ſomewhat tremulous, and a ſmall thin Cloud came over it. Dr. *Bevis* judged the Time might be relied on to two or three Seconds.

3. *An*

3. *An Obſervation of the* Eclipſe *of the* Sun, *on* Feb. 18. 1737. *made at* Edinburgh, *by* Colin Mac Laurin, *Profeſſor of* Mathematics *in that Univerſity, and F. R. S. in a Letter to* Martin Folkes, *Eſq; V. P. R. S.*

SIR,

I Hope the following Account of the late Eclipſe of the Sun, as it was obſerved here, and in other Parts of this Country, will not be unacceptable to you. In the Hiſtory of Eclipſes collected by *Ricciolus*, there are very few ſaid to be Annular; and of theſe ſome have been controverted, as that ſeen by *Clavius* at *Rome*, *April* 9. 1567, and that ſeen by *Jeſſenius* at *Torgaw* in *Miſnia*, *Feb.* 25. 1598, which are both diſputed by *Kepler*. Some Aſtronomers, Antient and Modern, have been of Opinion, that no Eclipſe can be Annular; and ſince ſuch ſeem to have been rarely obſerved, and I have not met with a particular Deſcription of any of them, I ſhall give you as full an Account of this Eclipſe as I can collect from the Obſervations that were made here, and thoſe that have been communicated to me from the Country.

The Sky was generally favourable in the Southern Parts of *Scotland* during the Eclipſe; and though there were great Showers of Snow in the North, they had ſometimes a View of it. There was ſomething very entertaining in the annular Appearance, a *Phænomenon* that was equally new to all who ſaw it, that gave great Delight to the Curious, without ſtriking Terror into the Vulgar. It extended Southward almoſt to *Morpeth* in *Northumberland*, and beyond *In-*

verneſs Northward; ſo that a Part of *England*, and almoſt all *Scotland*, were within its Limits. I have not as yet learned how far the North Limit was from us: In Expectation of ſome Letters from the remote Parts concerning this Limit, I have ſo long delayed ſending you this Account; but I am informed, that the Weather was very unfavourable there.

Ten Days before the Eclipſe, I wrote to many of my Acquaintance in the Country, deſiring that they would determine the Duration of the annular Appearance as exactly as poſſible; in Hopes, by comparing their Obſervations, to have traced the Path of the Centre and the Limits of this *Phænomenon* after the Example given in 1715, by Dr. *Halley*, to whom we owe the beſt Deſcription of an Eclipſe that Aſtronomical Hiſtory affords. I ſhall give you an Abſtract of the Accounts I received in Anſwer to theſe Letters, after I have deſcribed our Obſervations at *Edinburgh*.

The Times of the Appearances here were determined by a Pendulum Clock, which Mr. *Graham* gave me ſome Years ago, from whom I alſo had the meridian Inſtrument by which it is examined. The meridian Line was often adjuſted in the uſual Manner, and an exact Account of the Sun's Tranſits in the Meridian, and of the Tranſits of *Procyon* in a fix'd Teleſcope, was kept by Mr. *Short* for a long time before and after the Eclipſe; and, by comparing his Obſervations, I cannot doubt but that the Times were determined with ſufficient Exactneſs. I was often with him when he examined the Meridian, and obſerved thoſe Tranſits; particularly the Day of the Eclipſe, when by the Sun's Paſſage in the Meridian, we found that the Clock was before the apparent Time 13 Minutes 27 Seconds;

Seconds; and ſo much I have ſubducted from the Times that were marked during the Obſervation. The Latitude of this Place is commonly ſaid to be 55 Degrees 55 Minutes; and by ſome Trials we have made lately, this muſt be near the Truth, though in ſome Maps and Tables it be repreſented greater. By comparing an Obſervation we had here of the End of the Eclipſe of the Moon, *Nov.* 20. 1732. with an Obſervation of the End of the ſame Eclipſe by Mr. *Graham* at his Houſe in *Fleetſtreet*, the Longitude of this Place is a little more than 12 Minutes of Time further Weſt: But I may be able to give a more exact Account afterwards of the Longitude and Latitude of this City.

Some Days before the Eclipſe, the Right Honourable the Lord *Aberdour* ſet up a Clock in the Caſtle, and adjuſted it with mine by a Watch that ſhewed the Seconds. The Clocks were compared together the Day of the Eclipſe at Noon, by a Cannon fired from the Caſtle, ſome Perſons being appointed to attend each Clock, and mark the Seconds when they heard the Sound: An Allowance of two Seconds and a half being made for the Progreſs of the Sound, (which was determined by ſeveral Trials at Night) the Clock in the Caſtle was found to be before the apparent Time 12 Minutes 19 Seconds, and ſo much is ſubducted from the Times that were marked in the Caſtle during the Obſervation. It was agreed that we ſhould give Signals to one another mutually at the Beginning and End of the Eclipſe, and at the Beginning and End of the annular Appearance. His Lordſhip's Signal from the Caſtle was a Cannon, ours from the College a Muſquet, Perſons being appointed to mark our Signal from

from a proper Place of the Caſtle: There is no Regard however had to thoſe Signals in marking the Times of the Appearances. Lord *Aberdour* made uſe of a reflecting Teleſcope of 15 Inches and a half focal Diſtance, that magnified 90 times; only he obſerved the annular Appearance with one of 5 Inches and a half, that he might have a View of the whole Disk of the Sun at once. Mr. *Short* obſerved the Beginning of the Eclipſe with a Teleſcope of 15 Inches and a half focal Diſtance, that magnified 104 times, but the annular Appearance with one of the ſame Length, that alſo took in the whole Disk of the Sun, and magnified 50 times. The reflecting Teleſcope with which I obſerved the Eclipſe from the Beginning to the End, took in the whole Disk of the Sun, (having been made by Mr. *Short* for this Purpoſe) though the focal Diſtance of the big Speculum be 9 Inches and a half; and though it bears a higher Charge, I made uſe of an Eye-glaſs on this Occaſion, that magnifies only 50 times.

By a Computation that had been made here from Sir *Iſaac Newton*'s Theory, I expected that the Eclipſe would begin at 2 Hours 6 Minutes, apparent Time; we therefore looked attentively towards the South-weſt Part of the Sun's Limb from Two o'Clock. At 2 Ho. 5 Min. 36 Sec. we perceived a Depreſſion that was juſt diſcernible on the Sun's Limb near that Place; our Signal was then made, but by an Accident Lord *Aberdour* had been hindred from obſerving the Sun at that Time: However, when he looked for it, he ſaw it was begun, and his Signal gave general Intimation of this to the Town, about 40 Sec. after we had firſt perceived it; and, as far as I have learned, it was not diſcerned

diſcerned by the Eye, though aſſiſted with a ſmoaked Glaſs, till about this Time.

I obſerved the Progreſs of the Eclipſe by a Helioſcope; but after 10 Digits were eclipſed, I returned to the Teleſcope, to attend the Beginning of the annular Appearance. A little before the *Annulus* was complete, a remarkable Point or Speck of pale Light appeared near the Middle of the Part of the Moon's Circumference, that was not yet come upon the Diſk of the Sun; and a Gleam of Light, more faint than this Point, ſeemed to be extended from it to each Horn: I did not mark the preciſe Time when I firſt perceived this Light, but am ſatisfied that it could hardly be leſs than one fourth of a Minute before the annular Appearance began. Mr. *Short* (who was in another Chamber at ſome Diſtance, and made uſe of a larger Teleſcope) aſſures me that he ſaw it 20 Seconds before the *Annulus* was completed; and this is confirmed by a Call that was then heard from the Chamber where he was, of which I did not underſtand the Meaning till we met afterwards, and upon which the Perſon who made our Signals was about to fire, if I had not forbid him. I was ſurprized with this Light at firſt, and did not immediately recollect that it proceeded probably from the ſame Crown that was ſeen about the Moon in a total Eclipſe of the Sun at *Naples* in 1605; and was obſerved by many in different Parts of *Europe* in the three late total Eclipſes of 1706, 1715 and 1724. I did not expect to have ſeen this Light, when ſo much of the Sun's Diſk was uncovered; but as I kept only ſo much of the Diſk in the Teleſcope as was neceſſary for aſcertaining the Time of the Formation of the Annulus, this muſt have contributed to my

my diſcovering it; for this Light was very faint, compared with that which appeared upon the Sun's Arch near the ſame Place the Moment it was uncovered, and the Annulus completed.

Moſt of thoſe who obſerved the Eclipſe with Teleſcopes, mention in their Letters, that as the *Annulus* was forming, they perceived the Light to break in ſeveral irregular Spots near the Point of Contact, and that the Limb of the Moon ſeemed to be indented there. Some expreſs themſelves as if thoſe irregular Parts had appeared to them in a kind of Motion. It is thus deſcribed by Mr. *Bayne* (Profeſſor of the Municipal Law, a worthy Gentleman, whom we have ſince loſt) in a Letter to Lord *Aberdour*: "What appeared "to me moſt entertaining, ſays he, conſidered as an "Object of Sight, was, when the Extremities of the "Horns formed upon the Face of the Sun ſeemed as "if they had been in the Action of uniting their "Points, the Inequalities on the Extremity of the "Moon's Disk gave the Appearance, as it were, of "ſmall Bodies in particular Motion." There was not any Undulation at this Time on the Circumference of the Sun. I find that ſuch Appearances of a tremulous Motion in certain Periods of ſolar Eclipſes are mentioned by *Hevelius* and others. Lord *Aberdour* obſerved the Beginning of the annular Appearance with a ſmaller Teleſcope, and perceived only a narrow Streak of a dusky red Light colour the dark Edge of the Moon, immediately before the Ring was completed, and after it was diſſolved.

At 3 Ho. 25 Min. 55 Sec. the Circumference of the Sun appeared complete, and perfectly circular. We called at the ſame Inſtant to the Perſon who was appointed

pointed to make our Signal, and in a Second or two the Cannon from the Caſtle was heard. The *Annulus* appeared to the Eye to be central for ſome time, but in the Teleſcope it was always broader toward the South-eaſt than toward the North-weſt Part of the Sun's Disk. The Breadth appeared much greater to the naked Eye, than could have been expected from the Difference of the Semidiameters of the Sun and Moon. This was ſo remarkable, that ſuch a *Phænomenon* muſt have confirmed thoſe Aſtronomers in their Opinion, who imagined that the Diameter of the Moon is contracted in her Conjunctions with the Sun. This Appearance proceeded chiefly, I ſuppoſe, from the Light's incroaching on the Shade, as is uſual; but whatever was the Cauſe, every body ſeemed ſurprized that the Moon appeared ſo ſmall upon the Disk of the Sun.

It was obſerved, that the Motion of the Moon appeared more quick in the Formation and Diſſolution of the Annulus, than during its Continuance. This is particularly deſcribed by Mr. *Fullarton*, of *Fullarton*, in a very exact Account of the Eclipſe, as it appeared at his Seat at *Crosby*, near *Air*, on the Weſt Coaſt of *Scotland*, that has been communicated to me by a Friend. He writes that " the *Annulus* appeared " to be nearly of an uniform Breadth during the " greater Part of the Time of its Continuance, but " ſeemed to go off very ſuddenly; ſo that when the " Disk of the Moon approached to the concave Line " of the Sun's Disk, they ſeemed to run together like " two contiguous Drops of Water on a Table when " they touch one another;" and he adds, that it came on in the ſame way. This Appearance ſeems to be

accountable from the ſame optical Deception as the former.

During the Appearance of the Annulus, the direct Light of the Sun was ſtill very conſiderable; but the Places that were ſhaded from his Light appeared gloomy. There was a Dusk in the Atmoſphere, eſpecially towards the North and Eaſt. In thoſe Chambers that had not their Lights Weſtwards, the Obſcurity was conſiderable. *Venus* appeared plainly, and continued viſible long after the Annulus was diſſolved, and I am told that other Stars were ſeen by ſome: One Gentleman is poſitive, that, being ſhaded from the Sun, he diſcerned ſome Stars Northwards, which he thinks by their Poſition were in *Urſa Major*.

It was very cold at this Time; a little thin Snow fell; and ſome little Pools of Water in the College Area, where there was no Ice at two o'Clock, were frozen at Four. A reflecting Teleſcope of a large Size, and of a much greater Aperture than ordinary, that took in the whole Sun, and burned Cloth very ſuddenly through the tinged Glaſs at the Beginning of the Eclipſe, and on that account could not then be uſed with Safety, was that by which Mr. *Short* obſerved the annular Appearance. Some curious Gentlemen found, that a common Burning-glaſs, which kindled Tinder at 3 Ho. 59 Min. and burned Cloth at 4 Ho. 8 Min. had no Effect during the annular Appearance, and for ſome time before and after it.

I have mentioned thoſe things moſtly upon the Report of others; for during the greater Part of this Appearance I was obſerving the Progreſs of the Moon upon the Disk of the Sun through the Teleſcope. The firſt internal Contact of the Disks, at the Formation

tion of the Annulus, was conſiderably below the Weſt Point of the Sun's Diſk; and the ſecond Contact, at the Diſſolution of the Annulus, ſeemed to be about 10 Degrees Eaſtwards from the North Point or Zenith of the Diſk: But I did not find that the Poſition of thoſe Points of Contact could be eſtimated with Exactneſs on ſeveral Accounts. The Breadth of the Annulus towards the South-eaſt Part of the Sun's Diſk, was at leaſt double of its Breadth towards the oppoſite Part, about the Middle of this Appearance. An Apparatus, by which I was in Hopes of being able to determine thoſe things more accurately, was not ready. I propoſed to have made ſome Eſtimation of the *Ratio* of the Continuance of the annular Appearance, where it was central to its Continuance at *Edinburgh*, from that of the Arithmetical Mean betwixt the Numbers that ſhould expreſs the Proportion of the greateſt and leaſt Breadth of the Annulus to the Geometrical Mean betwixt the ſame Numbers; or from the *Ratio* of the *Radius* to the Sine of half the Arch intercepted between the two Points of internal Contact; but I did not obtain theſe *Ratio's* with ſufficient Exactneſs.

At 3 Ho. 31 Min. 43 Sec. the *Annulus* was diſſolved, after having continued 5 Min. 48 Sec. And here again our Signals were heard immediately after one another: The Middle of the Eclipſe was therefore at 3 Ho. 28 Min. 49 Sec. In this the Time by Obſervation did not agree ſo well with the Time by Computation as in the Beginning of the Eclipſe, the Difference being here about four Minutes. The Irregularities of the Moon's Surface occaſioned the ſame Appearances, in ſome meaſure, as at the Formation of the *Annulus*. When I returned to the Helioſcope,

there was ſome Time loſt in directing it towards the Sun; and when I got the Image in a due Poſition, there was leſs than 11 Digits eclipſed; and I ſuſpect that it never amounted to full 11 Digits. I had no Micrometer.

After taking ſome more Digits, I went with Sir *John Clerk* to a neighbouring Houſe, to obſerve the End of the Eclipſe, being afraid we ſhould not be able to ſee it from the College. By a Signal that was made to the Perſon who attended the Clock, (two Seconds being ſubducted, that were loſt in making the Signal) the End was at 4 Ho. 44 Min. 51 Sec. The Wind blew hard at this time, ſo that the Teleſcope could not be kept very ſteady, and there was ſome Undulation on the Circumference of the Sun; but I cannot think that the Error of this Obſervation can exceed three or four Seconds, the Circumference of the Sun appearing to me complete at that Inſtant.

I ſhall now ſubjoin the Obſervations that were made in the Caſtle and College in one View, by which you will ſee that they agree preciſely as to the Continuance of the annular Appearance, a Coincidence that could not have been expected; but ſo it is, according to the Numbers that were given me immediately after the Eclipſe by thoſe who attended the Clocks.

	In the College. H.	M.	S.	In the Caſtle. H.	M.	S.
The Beginning of the Eclipſe at . . .	2	5	36			
The Beginning of the annular Appearance	3	25	55	3	25	53
The End of the annular Appearance	3	31	43	3	31	41
The End of the Eclipſe	4	44	51	4	44	48

By Lord *Aberdour*'s Obſervations, the lowermoſt and biggeſt of the two Spots that appeared upon the Disk of the Sun in the upper Part, was touched by the Moon at 3 Ho. 4 Min. 40 Sec. and this Spot was wholly covered at 3 Ho. 5 Min. 19 Sec. Mr. *Short* obſerved another Spot at the Circumference of the Moon, at 2 Ho. 24 Min. 51 Sec. Though the Obſervations of the Digits could not be made with ſo much Exactneſs as the preceding, on ſeveral Accounts, I ſhall ſubjoin ſome of them.

		H.	M.	S.
The Sun was eclipſed	2 Digits at	2	21	14
	6 Dig.	2	50	54
After the annular Appearance	9 Dig.	3	45	57
	8 Dig.	3	52	55
	7 Dig.	3	59	53
	6 Dig.	4	6	51

At *Hopeton-Houſe*, nine Miles Weſt, and a little Northwards from *Edinburgh*, the Right Honourable Lord *Hope* obſerved the annular Appearance begin at 3 Ho.

3 Ho. 25 Min. the End of this Appearance at 3 Ho. 31 Min. and the End of the Eclipſe at 4 Ho. 44 Min. and a half. His Lordſhip was obliged to obſerve the Eclipſe at a Diſtance from the Clock, and to determine the Times by a Pocket Watch, that had been adjuſted by a very good Dial that Day at 12 o'Clock; but aſſures me, that the Duration of the annular Appearance was ſix Minutes, as near as could be judged by a Watch that did not ſhew the Seconds. The Moon appeared to touch the larger Spot above-mentioned at 3 Ho. 4 Min. and covered it in about half a Minute. The Emerſion of the ſame Spot was at 4 Ho. 13 Min. A leſſer Spot, higher on the Sun's Diſk, was not covered till 11 Minutes after the greater Spot, but appeared rather ſooner than it.

At *Crosby*, on the Weſt Coaſt of *Scotland*, about four Miles North from *Air*, Mr. *Fullarton* obſerved the Eclipſe to begin at two o'Clock. A diſtinct Annulus was formed about 20 Minutes after Three, which continued exactly ſeven Minutes, meaſured by a Pendulum vibrating Seconds. It appeared rather broader on the lower Verge of the Sun; but the Difference muſt have been very ſmall, for it was but barely diſcernible in a Species of the Eclipſe ſix Inches over, caſt on a Piece of Paper behind the Eye-piece of a Teleſcope ſix Feet long. He adds, that the Day-light was not greatly obſcured, appearing only ſo much dimmer than uſual, as that of the Sun is, when ſeen through a very gentle Miſt in a fine Morning in *April* or *May*. Sir *Thomas Wallace* found that the annular Appearance continued at his Houſe near *Lockryan* in *Galloway* five Minutes.

From

From the Obſervation at *Crosby*, the Centre of the annular Penumbra ſeems to have entered *Scotland* not far from *Irwine*. It proceeded afterwards towards the Eaſt, with a conſiderable Inclination Northwards; and probably left *Scotland* not far from *Montroſe* on the Eaſt Coaſt: For the Reverend Mr. *Auchterlony* found, that the annular Appearance continued there ſeven Minutes, as near as he could judge by an ordinary Watch. The *Annulus* alſo appeared to him of an uniform Breadth, through a common Teleſcope. This Obſervation, though not ſo exact as that at *Crosby*, is however confirmed by that at *St. Andrew's*, to be mentioned afterwards. Theſe two Obſervations at *Crosby* and *Montroſe*, were made nearer the Path of the Centre, than any others that have been communicated to me.

As for the Southern Limit of this Appearance, the Eclipſe was not Annular at *Newcaſtle*, and there wanted about 40 Degrees of the Limb of the Sun to appear in order to form an *Annulus*, according to the Obſervation of Mr. *Iſaac Thomſon*, communicated to me by Mr. *Blake*, a Gentleman of the County of *Durham*, who was preſent with us at *Edinburgh* during our Obſervation. The whole Duration of the Eclipſe was 50 Seconds leſs by his than by our Obſervation; and the bigger Spot was hid 1 Ho. 9 Min. 35 Sec. by his Obſervation, the Digits eclipſed at its Immerſion 7, 7; at its Emerſion 4, 1. Nor was the Eclipſe Annular at *Morpeth*, whence Mr. *John Willſon* writes, that the Body of the Moon appeared almoſt intirely on that of the Sun; and that, to the naked Eye, the Disk of the Sun ſeemed to be almoſt round.

But

But of all the Obſervations that have been communicated to me, that of Mr. *Long* at *Longframlington* *, determines the Southern Limit with the greateſt Exactneſs. The *Annulus*, he ſays, was very ſmall there upon the upper Part, and the Duration 40 or 41 half Seconds, meaſured by a Pendulum 9,81 Inches long; from which we may conclude, that the Limit was very near this Place. This curious Obſervation, with ſeveral others, was communicated by Mr. *Mark* at *Dunbar*. I have received no Accounts concerning this Appearance from any Places on the Weſt Coaſt of *England*. At *Alnwick* in *Northumberland* the Eclipſe was Annular, but I have not heard that the Time of its Continuance was meaſured.

At *Berwick*, the annular Appearance continued betwixt four and five Minutes: The End of the Eclipſe at *Dunbar*, by Mr. *Mark*'s Obſervation, was at 4 Ho. 48 Min. 16 Sec. but there was ſome Miſtake committed in reckoning the Vibrations of the Pendulum in meaſuring the Continuance of the Annulus.

At *St. Andrew*'s, this Appearance was obſerved to continue preciſely ſix Minutes, by a Pendulum Clock, by Mr. *Charles Gregory* and Mr. *David Young*, Profeſſors in the Univerſity. By a Figure of the *Annulus* taken from its Image, projected through a Teleſcope upon a Paper Screen, the Breadth towards the South-eaſt Part of the Sun's Disk is rather more than double of its Breadth towards the oppoſite Part.

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* *Longframlington* is ſeven computed Miles on this Side of *Morpeth*.

I have

I have already mentioned the Obſervation at *Montroſe*. At *Aberdeen* the *Annulus* was obſerved by Mr. *John Stewart*, Math. Prof. for 3 Min. 2 Sec. It was almoſt central, when the Clouds deprived him of any further View of it; he thinks it probable, that it continued there about ſix Minutes. Several Gentlemen, who live on the Coaſt Northwards from *Aberdeen*, were deſired to obſerve the Continuance of the *Annulus*; but I do not find that any of them ſaw this Phænomenon from the Beginning to its End.

At *Elgin*, the Eclipſe was obſerved Annular at 3 Ho. 29 Min. the larger Part of the Ring being uppermoſt, by the Reverend Mr. *Irwin*, who had a View of it for about 30 Seconds; but by reaſon of intervening Clouds could not determine the Beginning or End of this Appearance. At *Caſtle Gordon*, Mr. *Gregory* had one View of the Eclipſe while it was annular, but could make no further Obſervation for the ſame Reaſon.

At *Inverneſs*, the Eclipſe was annular for ſome Minutes, as I am informed by ſeveral Gentlemen; but they did not meaſure the preciſe Time how long it continued. By the Accounts I have had from *Fort Auguſtus* and *Fort William*, it is doubtful whether the Eclipſe was annular in thoſe Places or not. *Fort Auguſtus* is at the Weſt End of *Lochneſs*, and probably was not far from the Northern Limit of this *Phænomenon*. I have as yet received no Accounts of this Appearance from any Place further Northwards, or from any Place in the Weſt, but thoſe I have mentioned. Some Gentlemen in *Argyleſhire*, who obſerved this Eclipſe, were deprived of a View of the *Annulus* by the Clouds.

Mr. *Walker*, an ingenious Gentleman at *Frazerburgh* on the North Coaſt, (*Feb.* 18. 1737.) found that from the Time of the Ring's beginning to appear upon the lower and Weſtern Part of the Sun's Diſk, till it began to break on the Eaſt and upper Part, there were 300 Vibrations of a Pendulum, or five Minutes. The Ring ſeemed ſomewhat narrower even at the Middle of the Eclipſe on the lower Part.

This is the Sum of what I have been able to learn concerning the Obſervations of this Eclipſe, that were made in this Country, and in the neighbouring Parts of *England*. I have made ſome Computations relateing to the Extent of the annular *Penumbra*, and the Direction and Velocity of its Motion; but ſince I have not a ſufficient Number of exact Obſervations, by which I might examine them, it would be of little Uſe to deſcribe them. Had the Weather been more favourable in the North, and my Requeſt of having the Duration of the annular Appearance meaſured, been made more public before the Eclipſe, after Dr. *Halley*'s Example in 1715. I doubt not but I ſhould have been able to have given a more exact Account of the Progreſs of the Centre of this Phænomenon, and of its Limits; but I had been diſcouraged from publiſhing any thing concerning it, by our bad Fortune in ſeveral late Eclipſes, of which the Clouds had not allowed us the leaſt View.

I am informed, that there was very little Notice taken of this Eclipſe by the Populace in the Country; and I cannot but add, that ſeveral Gentlemen of very good Credit, who are not in the leaſt ſhort-ſighted, aſſure me, that about the Middle of the annular Appearance they were not able to diſcern the Moon upon

on the Sun, when they looked without a ſmoaked Glaſs, or ſomething equivalent.

I have taken Notice of this, becauſe it may contribute to account for what at firſt Sight appears ſurprizeing, that there are ſo few annular Eclipſes in the Liſts collected by Authors. *Kepler*, in his *Aſtron. Optic.* does not ſeem to acknowledge, that any Eclipſe, truly annular, had ever been obſerved. There are none mentioned by *Ricciolus*, from the Year 334 till 1567. though there are 13 or 14 total Eclipſes recorded within that Period; yet it is allowed, that the Extent and Duration of the annular Appearance may be conſiderably greater in the former, than of the Darkneſs in the latter. It may have contributed to this, that annular Eclipſes muſt have been rather incident in the Winter Seaſon in the Northern Hemiſphere, and that Eclipſes have been more readily total in the Summer, when their Chance of being viſible was greater, and the Seaſon more favourable for obſerving them. But perhaps the chief Reaſon why few annular Eclipſes appear upon Record, is, that they have not been diſtinguiſhed in moſt Caſes from ordinary partial ones. The Darkneſs diſtinguiſhed total Eclipſes, or ſuch as were very nearly total; and it is theſe chiefly, Hiſtorians mention. There are two central Eclipſes of the Sun ſtill famous amongſt the Populace in this Country: That of *March* 29. 1652. was total here, and that Day is known amongſt them by the Appellation of *Mirk Monday*. The Memory of the Eclipſe of *Feb.* 25. 1598. is alſo preſerved amongſt them, and that Day they term, in their way, *Black Saturday*. There is a Tradition, that ſome Perſons in the North loſt their

Way in the Time of this Eclipſe, and periſhed in the Snow.

There was a remarkable total Eclipſe of the Sun in this Country, *June* 17. 1433. the Memory of which is now loſt among the Populace; but it appears from a Paſſage in a Manuſcript in our Library, that it was formerly called by them the *Black Hour*, after their uſual Manner. It is deſcribed thus: "Hoc anno "fuit mirabilis Eclipſis Solis, 17mo die menſis *Junii*, "hora quaſi tertia poſt meridiem; & per dimidium "horæ tenebræ tanquam in nocte ſupergreſſæ ſunt "ſuperficiem terræ, ita ut nihil obtutibus humanis per-"vium fuit; unde abhinc vulgariter dicta fuit Hora "Nigra." This Eclipſe is not in *Ricciolus*'s Catalogue, but is mentioned by him in another Place, *Schol. Cap.* 2. *L.* 5. By a Computation of this Eclipſe, the Sun was within two Degrees of his *Apogeum*, and the Moon within 13 Degrees of her *Perigeum*; ſo that this muſt have been a remarkable Eclipſe. The Progreſs of the Shadow was towards the South-eaſt; and *Sethus Calviſius* cites the *Turkiſh* Annals for its being total in ſome Part of their Dominions.

You will perceive by this Account, that we have no Obſervatory in this Place; but we are in Hopes that ſome time or other we ſhall obtain one from the Patrons of the Univerſity. I doubt this laſt Eclipſe will not be diſtinguiſhed by any particular Appellation amongſt the Populace, as the former that were central in this Country. The Remembrance of it however will be preſerved by the Curious, who obſerved it with great Pleaſure, and agree that it was the moſt entertaining Spectacle of this kind they ever ſaw. I

ſhall

ſhall be glad if this Account of it give you any Satisfaction, and am with the greateſt Reſpect,

SIR,

Edinburgh, May 12, 1737.

Your moſt obedient, moſt humble Servant,

Colin Mac Laurin.

P. S. We looked for the Occultation of *Aldebaran* by the Moon on *Feb.* 25. in the Evening; but the Star paſſed by the upper Horn, without being hid, at a Diſtance from it, that was by Eſtimation nearly equal to the Diſtance betwixt the neareſt Part of the Spots *Eudoxus* and *Ariſtotle.*

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4. *An Account of the* Obſervations *of the late* Solar Eclipſe *made at* Edinburgh, *on* Feb. 18, 1736-7. *by the Honourable Sir* John Clerk, *Bart. one of the Barons of his Majeſty's Exchequer there, and F. R. S. Communicated by* Roger Gale, *Eſq*; *F. R. S.*

ON the 18th of *February* laſt, we had a very fine bright Day for obſerving the Eclipſe; and never was any thing of that kind, I believe, obſerved with more Exactneſs. In ſeveral Places for 10 Miles round this City, as well as in it, were ſome skilful Perſons ſtationed for that Purpoſe: I myſelf happened to be in the Caſtle here, which is an Eminence at leaſt of 500 or 600 Feet in Height, beſides a great Aſcent from the Level of the Sea to the Foot of the Rock upon which it is ſituated.

Our Profeſſor of Mathematics, Mr. *Mac Laurin,* a Perſon of great Knowledge in this Science, had placed himſelf at a Window in our College; others were

were ſent where the Eclipſe, we ſuppoſed, would be perfectly central, about 12 or 14 Miles farther North.

A Gun from the Caſtle was fired at 22 Seconds after Twelve, mean Time, (or 12 Minutes 22 Seconds before Twelve, apparent Time) upon which, by Agreement, the Clocks and Watches of the Obſervers were adjuſted. A ſecond Cannon was diſcharged preciſely when the Eclipſe began, which was at 5 Minutes 36 Seconds after Two. A third was diſcharged when the annular Appearance began, which was at 25 Minutes 55 Seconds after Three; its Continuation was 5 Minutes 48 Seconds. A fourth Cannon was fired at the End of the Eclipſe, which was at 44 Minutes 50 Seconds after Four; all reckoned by apparent Time. We had half a ſcore good reflecting Teleſcopes to make theſe Obſervations, and our Calculations perfectly agreed, ſo that you may depend upon them as moſt exact.

This was not done by us as a Matter of mere Curioſity, but to aſſiſt in aſcertaining the Motions of the Moon, on Sir *Iſaac Newton*'s Theory, upon which a good deal of the Doctrine of the Longitude will depend. Sir *Iſaac*'s Calculation, as to the Beginning of this Eclipſe, was pretty right; but not ſo well as to its central Appearance. Two Spots in the Sun made a very diſtinct Appearance to us, as they entered under the Moon's Body; one was a little above the central or horizontal Line of the Sun, of this Shape ; the other was near the Edge, on the Eaſt Quarter. The firſt, by Compariſon with the Sun's Diameter, was larger than the Diſk of our Earth; it was dark in the Middle, and certainly emitted no Fire or Light. The Edge of the Moon appeared a little ragged

ged or rough, but not mountainous, becauſe of the Sun's Light. There was no conſiderable Darkneſs, but the Ground was covered with a kind of a dark greeniſh Colour. Two Stars appeared, the Planet *Venus*, and another farther Eaſtward. This Account is what you may depend on. . . . . .

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5. *Obſervations of the* Solar Eclipſe, *an* Feb. 18, 1736-7. *made at* Trinity-College, Cambridge, *and at* Kettering; *communicated in a Letter from Mr.* Charles Maſon *to Mr.* John Senex, *F. R. S.*

	H.	M.	S.	
The Beginning by the Clock . .	at 2	36	40	
The End	at 5	14	12	Exact.

Digits.	The Eclipſe Obſerved. Increaſing. H.	M.	S.	Decreaſing. H.	M.	S.
$0\frac{1}{2}$	2	39	30	5	11	50
1	2	43	00	5	9	00
$1\frac{1}{2}$	2	46	40			
2	2	50	25			
$2\frac{1}{2}$	2	54	15	4	59	30
3	2	58	05			
$3\frac{1}{2}$	3	1	55			
4	3	5	50			
$4\frac{1}{2}$	3	9	50			
5	3	14	00	4	42	55
$5\frac{1}{2}$	3	18	10	3	39	10

Digits.	The Eclipſe Obſerved. Increaſing. H.	M.	S.	Decreaſing. H.	M.	S.
6	3	22	20	4	35	20
$6\frac{1}{2}$	3	26	30			
7	3	30	40	4	27	40
$7\frac{1}{2}$	3	34	50	4	23	55
8	3	39	30	4	20	10
$8\frac{1}{2}$	.	.	.	4	16	30.
9	Clouds.			4	13	00
$9\frac{1}{2}$	.	.	.	4	10	10
10	.	.	.	4	7	50

	H.	M.	S.
The leſſer Spot immerged	at 2	58	50
The greater Spot begun to immerge .	at 3	33	05
The Middle . . .	at 3	33	20
The End at	3	33	37

Times

Times obſerved at *Kettering*, as follow:

	Ho.	Min.
Beginning	2	21
2 Digits	2	36
Centre	3	07
	4	22
End	4	59
Great Spot immers'd	3	18

N. B. The Obſervatory Clock was 1 Minute 50 Seconds too ſlow, which being added all the way, will give true Time.

I ſhould be obliged to you, if I could have any Obſervations that correſpond with theſe, to compare them: theſe are moſt of them tolerably exact; but the Wind, and other Difficulties, make ſome of them a little precarious. The Time is nearly true, if the Error be corrected depending upon the Truth of a Meridian Teleſcope, which I can yet correct, if any nicety of Longitude require it. I hope you will excuſe my freedom in troubling you with with this from

Your humble Servant,

Cha. Maſon.

6. De-

6. Defectus Solis *obſervatus e Specula* Bononienſis Scientiarum Inſtituti, *die prima* Martii 1737. *N. S.*

INitium hujuſce deliquii calculos noſtros minutis horariis plus ſeptem antevertit. Hora enim 3 min. 33 ſec. 36 jam aliquid Solaris marginis a Luna delibari apparuit, directo intuitu per vitrum fuligine infectum, ac teleſcopio pedum undecim aptatum (cum paullo ante, hoc eſt in ipſo ſcrupulo 33, eodem teleſcopio Sol plane rotundus viſus eſſet) : calculi autem initium in horam 3. 41 conjiciebant.

Deinceps digitos eclipticos notavimus trajecto Solis radio per tubum opticum pedum ſex, eoque excepto in tabella candida, cui tabellæ circulus inſcriptus erat ad imaginem Solis commenſus, atque in digitos ac ſemidigitos diſpertitus. Verum obſervationi haud parum obſtitit ventus machinam exagitans. Certiores phaſes hæ fuiſſe videntur.

Hor.	Min.	
3.	40	Deficiebat digitus præterpropter
3.	48	Duo digiti
3.	57	Digiti tres
4.	6	Digiti quatuor
4.	15½	Quinque digiti
4.	35	Digiti ſeptem
4.	45	Septem cum ſemiſſe, quæ nobis obſcuratio maxima viſa eſt
4.	55	Iterum digiti ipſi ſeptem, Eclipſi jam decreſcente.

Poſtmodum cum ſpecies Solis in occaſum vergentis nimis fluctuans ac trepida viſeretur, necnon ex rotunda in ovalem ſat manifeſte deformata, a digitorum dimenſione, quippe haud ſatis certa, ceſſavimus.

Nonnullæ apparebant in Sole maculæ, tres præſertim, quarum poſitiones ipſo meridie ejus diei ab obſervationibus deſcriptas exhibet ſubjectum ſchema. [*vide* TAB. II. FIG. 1.] Duarum ex his occultationes ita definivimus eodem tubo pedum undecim.

Hor.	Min.	Sec.	
4.	23.	18	Limbus Lunæ coronam maculæ A contingit
	23.	49	Nucleum ipſum maculæ A tegere incipit
	24.	25	Totum nucleum abſcondit
	26.	14	Maculam B diſtringit
	26.	31	Totam involvit.

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7. Defectus Solis *ex* Monte Aventino Romæ *obſervatus, die prima* Martii, *A.* 1737. *N. S. a* Didaco de Revillas, *Abbate* Hieronym. *R. S.* Lond. *S.*

TRajecta per teleſcopium Campani Ped. 6. Solis ſpecie, hanc tabella alba excipiebat, cum circulus ſpeciei æqualis in digitos XII diviſus, inſcriptus erat. Phaſes hocce organo obſervatæ, ſunt hujuſmodi.

H. p. m.	M.	S.	
3.	43	4	Limbus Solis jam limbo Lunæ aliquantulum obſcuratus deprehenditur.
	51	50	Digit. I.
4.	0	40	Digit. II.
	9	30	Digit. III.
	18	20	Digit. IV.
	27	10	Digit. V.
	36	0	Digit. VI Dum limbus Lunæ centrum Solis attingit, denſæ nubes utriuſque luminaris & ſequentium eclipſis phaſium conſpectum eripiunt.

8. Eclipſis

8. Eclipſis Solis *partialis, quæ die* XIIX. Feb. *St. Vet. ſive* D. 1. Martii *St. Nov. A.* 1737. *contigit*, Phaſes *decreſcentes* Vitembergæ Saxonum *obſervatæ, a* J. Frederico Weidlero, *Math. Prof. & R. S.* Lond. *S.*

Digiti Eclipſeos decreſcentis. *Vide* Schema in Tab. II. Fig. II.

	H.	M.	S.	
VIII	4	50	31	p. m.
VII $\frac{3}{4}$		58	16	
VII $\frac{1}{2}$	5	1	56	
VII $\frac{1}{4}$		5	26	
VII		8	16	
VI $\frac{1}{2}$		10	16	Poſtea Sol ad occaſum vergens nubes ſubiit.

Initium propter nubes cœlo obductas videri non potuit.

VIII. *A Letter from the Revd* Ebenezer Latham, *M. D. and V. D. M. to* C. Mortimer, *M. D. Sec.* R. S. *containing a* Propoſal *to make the* Poles *of a* Globe *of the* Heavens *move in a Circle round the Poles of the* Ecliptic; *read at a Meeting of the* Royal Society, April 17. 1738.

SIR, *Findern, April* 14, 38.

I Take the Liberty through your Hands to communicate the incloſed to the *Royal Society*, and at the ſame time to ſubmit to that learned Body a Pro-

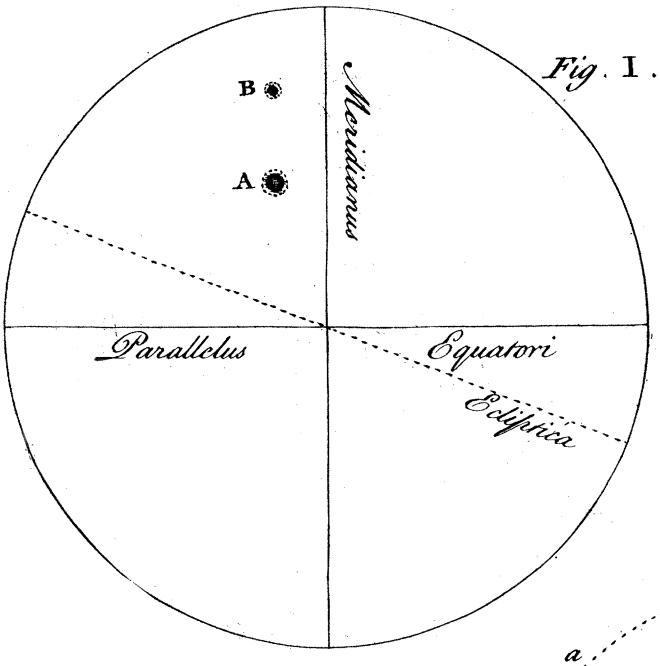
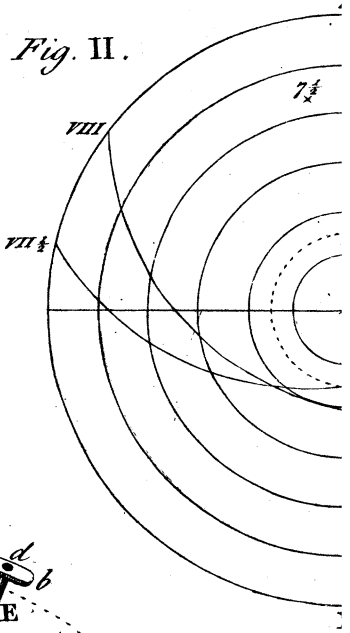


Fig. I.

Fig. II.



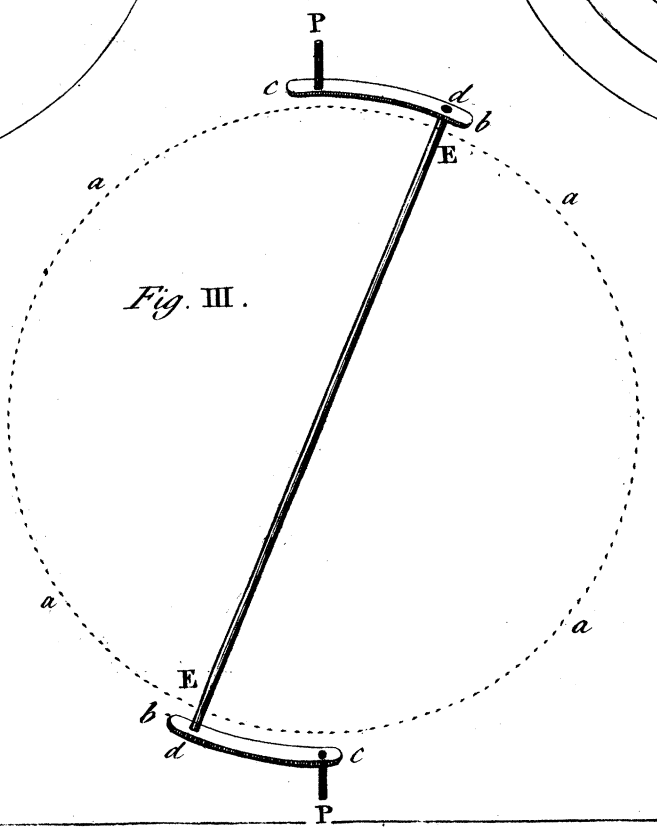
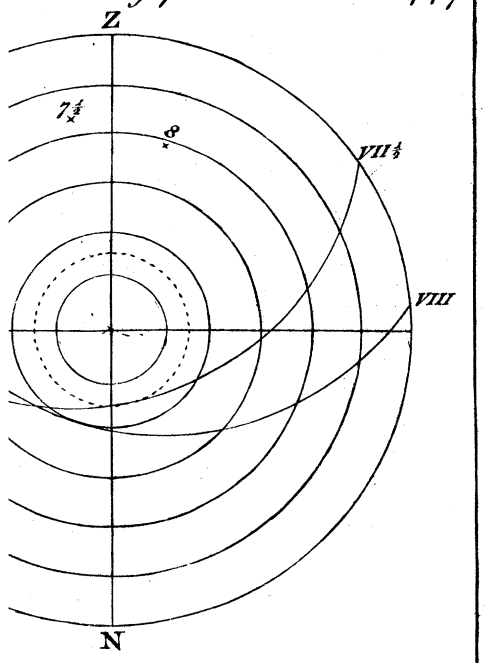


Fig. III.



J. Mynde sc.

Philosoph. Transact. N.o 447

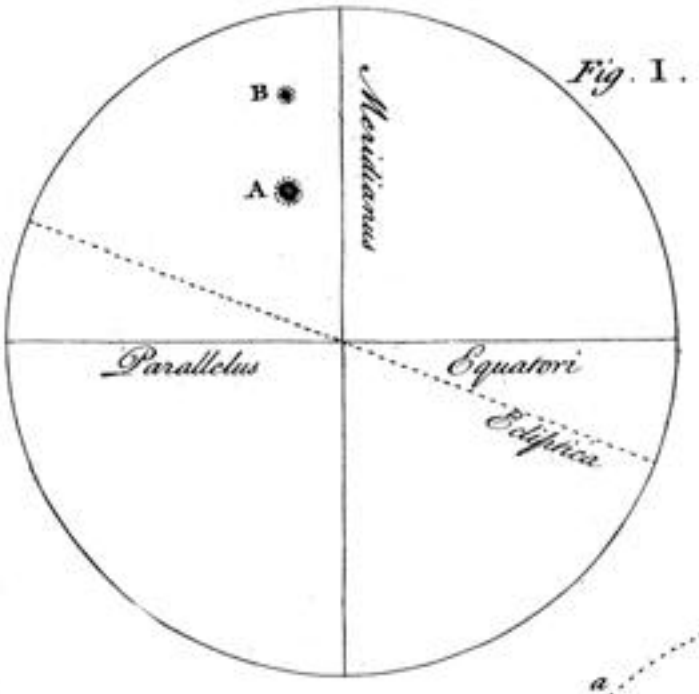


Fig. I.

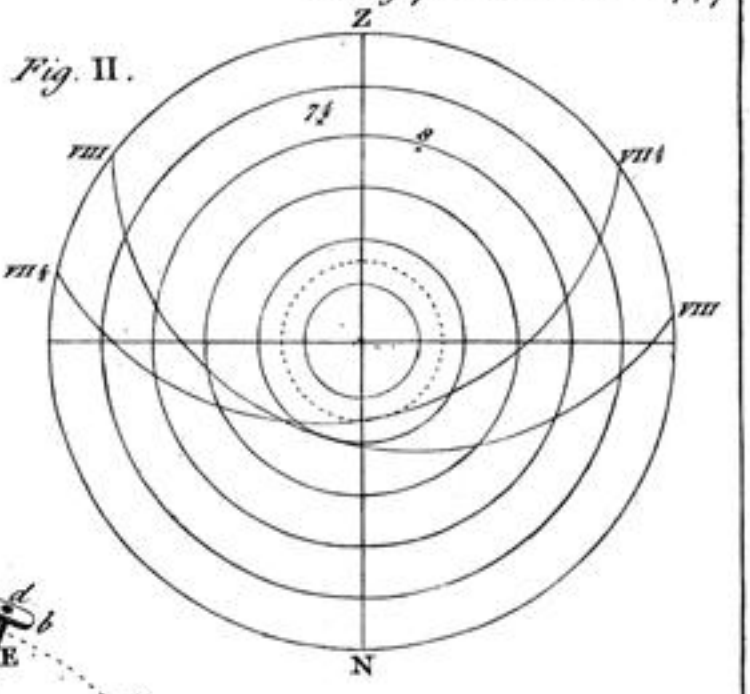


Fig. II.

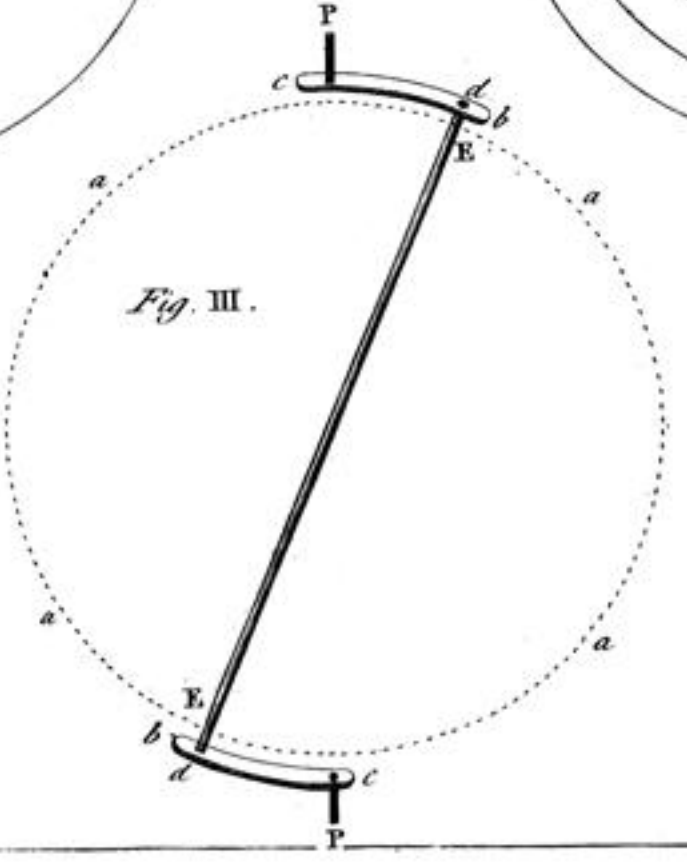


Fig. III.

J. Myndt sc.